# Honors Chemistry - Gas Laws Problem Set

## Stasya

1. The pressure atop the world's highest mountain, Mount Everest, is usually above 33.6 kPa. Convert the pressure to atmospheres and torr. How does the pressure compare to the pressure at sea level?

2. Standard temperature for tabulated thermodynamic data in all chemistry books is 25°C. Convert this value to both Fahrenheit and Kelvin units.

3. What would happen to life on earth if ice were denser than liquid water?

4. Explain why an unopened bag of potato chips left in a car on a hot day appears to become larger.

5. Hot-air balloons rise because the hot air inside the balloon is less dense than the cooler air outside. Calculate the volume an air sample will occupy inside a balloon at 43.0°C if it occupies 2.50 L at the outside air temperature of 22.0°C, assuming the pressure is the same in both locations.

6. The lowest pressure achieved in a laboratory is about $1.0 \times 10^{-15}$ mm Hg. How many molecules of gas are present in a 1.00 L sample at that pressure and a temperature of 22.0°C?

7. Determine the pressure inside an old-fashioned television picture tube with a volume of 3.50 L that contains $2.00 \times 10^{-5}$ g of nitrogen gas at 22.0°C.

8. Carbon monoxide is a product of incomplete combustion of fuels. Find the volume that 42 g of carbon monoxide gas occupies at STP.

9. A gas diffuses 5/3 times faster than carbon dioxide. Calculate the molar

mass of the gas, and determine which it might be.

10. If 45.0 L of natural gas, which is essentially methane ($CH_4$), undergoes complete combustion at 730 mmHg and 20.°C, how many grams of each product are formed?

11. A 3.25 gram sample of solid calcium carbide ($CaC_2$) reacts with water to produce acetylene gas ($C_2H_2$) and aqueous calcium hydroxide. If the acetylene was collected over water at 17°C and 740.0 mmHg, how many milliliters of acetylene were produced? The vapor pressure of water at 17°C is 14.5 torr.

12. Helium gas diffuses at a speed of 4.53 m/s. Calculate the speed of hydrogen gas. They are both at 298K.

13. Determine how many moles of water vapor will be produced at 1.00 atm and 200°C by te complete combustion of 10.5L of methane gas ($CH_4$).